

STUDIES ON PHYSIOCHEMICAL DIMENSIONS OF TWO BASMATI (SUPER BASMATI, BASMATI 385) AND TWO NON-BASMATI (KS-282, IR-6) PAKISTANI COMMERCIAL RICE VARIETIES

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Pakistan is an agriculture country which has large variety of crops grown. Rice is one of the very important crops of Pakistan which plays pivotal role in countries economy. In this study, physiochemical characteristics of two aromatic and two non-aromatic commercial rice varieties of Pakistan were studied. Super Basmati showed highest value for kernel length and thickness while IR-6 showed lowest values for both trait 6.6mm and 3.170mm respectively. IR-6 revealed maximum kernel breath while Basmati 385 disclosed lowest in value. The gel consistency, an indicator of texture softness, was significantly higher for the both Basmati rice as compared to non-Basmati rice varieties. The alkali spreading value for Basmati rice varieties was low and high for the non-Basmati varieties. High amylose content was observed in IR 6 rice variety.

Keywords: Physicochemical Dimensions, Basmati Rice, Non-Basmati Rice

INTRODUCTION

Rice is one of the most important food grain crops of the world. It is the staple food of more than 50 percent of the world population. In Pakistan, it is the second most consumed cereal after wheat. Pakistan is blessed with multitude of agro-climatic condition for growing several types of rice i.e. aromatic (Basmati) and non aromatic (non-Basmati). Out of total cultivated area 2.23 million hectare is under rice cultivation, producing about 4.48 million tons of white rice. Two-third of total production is consumed domestically and rest one-third is exported. Pakistan stands fourth after Thailand, U.S.A and Vietnam in the world in term of rice export. The kalar tract consisting of Gujranwala, Sheikhpura and Sialkot districts is quite famous for rice production. Pakistani Basmati varieties are famous in the world trade for their distinct aroma and excellent cooking and eating qualities (Anonymous, 2002). Physiochemical properties of rice are determinant of cooking and eating quality that affects overall acceptability of rice. Physical characteristics include whiteness, broken grains, shape, and chalkiness. Whiteness (polish) and broken indicate milling quality, Shape, grain length to breadth ratio, and chalky areas in grain are varietal characteristics. Consumer should prefer white, long slender rice with few broken and little chalkiness. The chemical characteristics—amylose content, gelatinization temperature, gel consistency, alkali spreading value and aroma effect cooking and eating quality. Amylose content is the most important chemical characteristic and determines the hardness of cooked rice. Rice with high amylose content became harden on cooling after cooking, therefore, price should be related inversely with amylose contents. Gel

consistency is another measure of cooked rice texture. A higher number indicates a soft consistency; therefore, gel consistency should correlate positively with price. Gelatinization temperature (GT) determines the time required for cooking. Alkali spreading value is the indirect measure of gelatinization temperature, alkali spreading values were inversely correlated with gelatinization temperature. Aroma is a special measure of rice acceptance. (Unnevehr *et al*, 1985).

Keeping in view the above facts the present study was designed to have an idea about cooking and organoleptic properties of cooked rice. To study the cooking behavior and eating quality and in this respect make comparison between Basmati varieties (super Basmati, Basmati-385) and Non-Basmati rice varieties (KS-282, IR-6).

MATERIALS AND METHODS

Four commercial rice varieties were obtained from rice NARC, Islamabad. Samples were divided into aromatic varieties i.e super Basmati and Basmati 385 and non-aromatic varieties such as KS-282 and IR-6.

Length and breadth of rice were determined by an ordinary scale (ruler) as an average of 20 uniform ally milled rice at random.

Length to breadth ratio was computed by formula, average length divided by average breadth of 20 rice kernels. Classification of rice kernel into extra-long, long, intermediate and short on the basis of size was carried out according to the scale given by P.S.I. (1993).

Shape based classification of rice kernels was done into lender, medium, bold and round shape by scales provided by Khush *et al* (2003). The four varieties are divided into

coarse and fine group on the basis of quality index formula given by Azeez and Shafi (2000). Amylose contents was determined according to modified method of Juliano (1999) and on basis of this rice kernel was classified into waxy, low, intermediate, moderately high and high amylose contents with scale reported by Juliano and Pascual (2002). Alkali spreading value, gelatinization temperature and gel consistency were determined by techniques described by Cagampang *et al* (1973) respectively.

STATISTICAL ANALYSIS

The data obtained for the parameters was statistically analyzed by Complete Randomized Design (CRD) and Latin Square Design to separate the means according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Physicochemical dimensions of various rice varieties are given in Table 1. Maximum kernel length is found in Super Basmati and it is significantly different from other varieties. Basmati 385 and KS 282 are not significantly different in terms of kernel length and both are significantly different from rest of two varieties. IR-6 has minimum kernel length. The length of raw rice is polygenic ally controlled trait of a variety with little influence of environmental and culture practices. Maximum kernel breadth is found in IR-6 and it is not significantly different from KS-282. Super Basmati and Basmati 385 are not significantly different from each other regarding their kernel breadth and both are significantly different from rest of two varieties. Minimal kernel breadth is found in Basmati 385. These observations for kernel length and breadth were according to the findings of Sagar *et al.* (1988). Length of the rice is physical quality parameter and determines the consumer's acceptance; usually consumer prefers the long grain rice. Rice kernel is classified on the basis of their lengths. Super Basmati and Basmati-385 are extra long and long, respectively, which is their desirable physical parameter. Greater value for kernel breadth is not good quality profile. All coarse varieties have higher values for breadth thickness than Basmati rice varieties.

Maximum kernel thickness is found in KS 282 and is not significantly different from IR-6. Basmati 385 has minimal thickness and is not significantly different than Super Basmati. Lower value for thickness is an acceptable quality trait.

Maximum length to breadth ratio is found in Super Basmati (4.543) followed by Basmati-385 (4.210) and are significantly different from KS-282 and IR-6. KS-282 and IR-6 are not significantly different from each other. IR-6 has minimal length to breadth ratio. Length to breadth ratio in rice signifies the shape of the grain. As the values in all varieties are above 3, therefore, these are named as "slender". These findings are in lined with the claim of Khush *et al.* (1979).

All varieties have quality index significantly different from each other. Maximum quality index is found in Super Basmati (2.957) followed by Basmati-385 (2.810). Quality index of KS-282 is 1.797 and IR-6 has 1.823. Quality Index value equal to or greater than 2 defines the rice as "fine" and less than 2 is "coarse". Both super Basmati and Basmati-385 varieties are fine type and KS-282 and IR-6 are "coarse" type on the basis of quality index. These findings match with the findings of Azeez and Shafi (1966).

Super Basmati and Basmati 385 are grouped as intermediate rice because their range is 20 to 25% and KS-282 and IR-6 are grouped as high amylose rice because their range is above 27 %. Amylose content is the most important chemical characteristic that determines the hardness of cooked rice. Rice with high amylose contents was hardened quickly after cooling, therefore, price should be related inversely with amylose contents. The rice with high amylose content was less sticky on cooking due to less amylopectin content. These observations are lined with the findings of Juliano and Pascual (1980).

Higher values of gel consistency were found in Basmati rice, which place them in soft gel consistency group. On the other hand coarse varieties have lower values for the same trait which place them in hard gel consistency group. Gel consistency is another measure of cooked rice texture. A higher number indicates a soft consistency; this classification is agreed with the classification reported by Cagampang *et al.* (1973). Therefore, gel consistency should correlate positively with price. Basmati rice has less score while non-Basmati rice having high score. This is because of high amylose contents in non-basmati rice.

Alkali spreading value for Basmati rice has less score while non-Basmati rice having high score. This is because of high amylose contents in non-basmati rice. These findings are according to the findings of Warth and Darabett (1914). Alkali spreading value is also the indirect measure of gelatinization temperature, alkali spreading value was inversely correlated with gelatinization temperature. Gelatinization temperature (GT) determines the time required for cooking.

Table 1: Physiochemical dimensions of aromatic and non-aromatic rice varieties

Varieties	Length of kernel (mm)	Kernel breadth (mm)	Length to breadth ratio	Kernel thickness (mm)	Quality index	Amylose contents %db	Gel consistency (mm)	Alkali spreading 1.7% KOH
Super basmati	7.460 A	1.640 B	1.540 B	4.543 A	2.957 A	22.50 D	65.00 B	4.5
Basmati 385	6.753 B	1.607 B	1.490 B	4.210 B	2.810 B	23.30 C	68.00 A	4
KS-282	6.730 B	1.980 A	1.853 A	3.400 C	1.797 D	28.37 B	45.67 C	6
IR-6	6.600 C	2.130 A	1.800 A	3.170 C	1.823 C	29.47 A	44.00 C	7

CONCLUSION

The in view study shows that the super basmati and basmati 385 are the best in organoleptic quality, but non-basmati varieties also have some good attributes like high volume expansion and less bursting on cooking. The Basmati rice have good aroma while no aroma in non-basmati varieties. The gel consistency was good indicator of texture, soft texture is definitely preferred over the hard which is due to high amylose content, rice with high amylose contents hardened quickly on cooling but Basmati rice remained soft on cooling for longer period of time which is a desirable feature. Elongation ratio is high in basmati varieties on cooking that is also a significant desirable characteristic of basmati rice.

It is concluded that some attributes of basmati varieties are good while some are good in non-basmati varieties. So consumer has to decide according to his circumstance and keeping in mind his economic conditions.

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